

Abstract

The synthesis of Pt and PtRu and other Pt based nano-particles that catalyze the electrochemical oxidation of methanol, carbon monoxide and hydrogen, as well as oxygen reduction, is described. The Pt based catalysts are synthesized in solution forming particles of 0.8 to 10 nm size (forming a “colloidal” solution) and are subsequently applied to a desired substrate as e.g., carbon black, graphite, metals. The application of the nano-sized catalyst particles on the substrates involves electroless deposition at open-circuit, such as immersing the substrate into the colloidal solution or spraying the catalyst particles on the substrate. The Pt, PtRu and other Pt based catalyst can also be directly deposited on the substrate involving the simultaneous reduction and deposition of the Pt based catalysts onto the substrate surface and into its porous structure. The presently described synthesis and deposition of the resulting Pt based nano-particles on and into a variety of high surface area and preferably electronically conductive substrates results in electrodes of high surface areas, relates directly to the preparation and use of high surface area electrodes, (anodes and cathodes) which could be used in e.g., direct methanol, hydrogen and hydrogen containing carbon monoxide fuel cells.